

|                        |  |                 |
|------------------------|--|-----------------|
| PH                     | NL<br>030617   | MAT.<br>DOSSIER |
| Europäisches Patentamt |  |                 |
| (19)                   | <br>European Patent Office<br>Office européen des brevets |                 |



(11) EP 1 005 061 A1

## (12) EUROPEAN PATENT APPLICATION

(43) Date of publication:  
31.05.2000 Bulletin 2000/22

(51) Int Cl.7: H01K 1/00

(21) Application number: 99309258.4

(22) Date of filing: 19.11.1999

(84) Designated Contracting States:  
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU  
MC NL PT SE  
Designated Extension States:  
AL LT LV MK RO SI

(30) Priority: 26.11.1998 JP 33605798

(71) Applicant: Phoenix Electric Co., Ltd.  
Himeji-Shi, Hyogo-ken (JP)

(72) Inventor: Kokado, Haruo,  
Phoenix Electric Co. Ltd.  
Himeji-shi, Hyogo (JP)

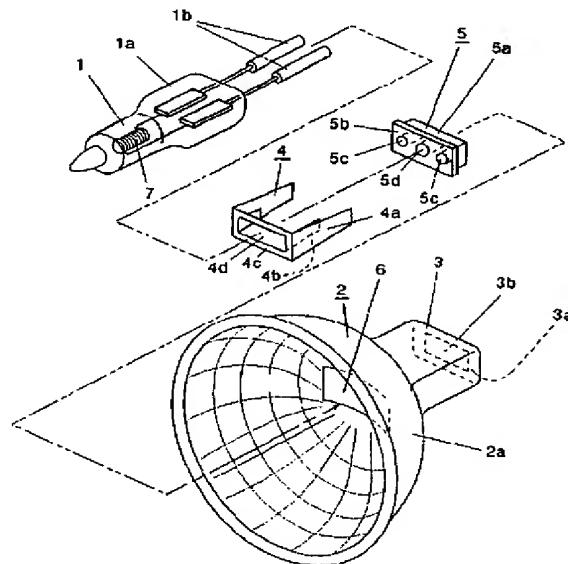
(74) Representative: Hillier, Peter et al  
Reginald W. Barker & Co.,  
Cliffords Inn  
Fetter Lane  
London EC4A 1BY (GB)

### (54) Halogen lamp with reflector

(57) A halogen lamp with reflector (2) which allows a pinch seal portion (12) to be fitted onto a lamp mount portion (3) of a reflector (2) simply by inserting a lamp body (1) with a pinch seal support (4) and a lead rod support (5) into the lamp mount portion (3), thrashes the cost and prevents an inorganic adhesive (8) from contaminating a concave reflecting section (22) of the reflector (2), and is suitable for achieving high wattage. An insulating lead rod support (5) is mounted to lead rods

(1b), and a pinch seal support (4) is mounted to the pinch seal portion (1a). The lead rod support (5) is inserted into a bottom aperture (3b) of the lamp mount portion (3). The pinch seal support (4) includes an insertion hole (4d) for passing the pinch seal portion (1b) therethrough, pinch seal abutting pieces (4b), reflector abutting pieces (4a), and an opening closing portion (4c) closing the front opening (6). An adhesive (8) is injected into a gap between the pinch seal portion (12) and the lamp mount portion (3).

Fig.1



**Description****BACKGROUND OF THE INVENTION****Field of the Invention**

[0001] The present invention relates to a halogen lamp with reflector.

**Description of the Prior Art**

[0002] Fig. 5 is a cross sectional view of a conventional halogen lamp with reflector.

[0003] Referring to Fig. 5, the conventional halogen lamp with reflector includes a halogen lamp body (11) and a reflector (12) in which the halogen lamp body (11) is disposed at a center thereof.

[0004] The halogen lamp body (11) includes a pinch seal portion (11a).

[0005] Lead rods (11b) connected to a filament (16) in the halogen lamp body (11) are drawn out from the pinch seal portion (11a) to the outside.

[0006] A rearwardly protruding lamp mount portion (13) of the reflector (12) is disposed at the center of the reflector (12), and the pinch seal portion (11a) of the halogen lamp body (11) is inserted into the lamp mount portion (13) and fixed by an inorganic adhesive (14).

[0007] In the conventional halogen lamp with reflector, a method of mounting the halogen lamp body (11) onto the reflector (12) is as follows.

[0008] First, the pinch seal portion (11a) of the halogen lamp body (11) is inserted into the lamp mount portion (13) disposed at the center of the reflector (12).

[0009] Then, the halogen lamp body (11) is focalized by a three-dimensional and oscillating movement. When the halogen lamp body (11) is focalized, an inorganic adhesive (14) is injected into a gap between the pinch seal portion (11a) and the inside surface of the lamp mount portion (13) through an injection aperture (15a) disposed in a release paper (15) stuck so as to close a bottom aperture (13a) of the lamp mount portion (13).

[0010] The halogen lamp body (11) is held until the inorganic adhesive (14) is dried and hardened to some extent and is capable of holding the halogen lamp body (11).

[0011] Lastly, the release paper (15) is peeled off, and the inorganic adhesive (14) is calcined. Thus, the halogen lamp body (11) is fixed onto the reflector (12) in the conventional method.

[0012] In this case, as will be understood from Fig. 5, the inorganic adhesive (14) immediately after its injection is soft and also the pinch seal portion (11a) buried in the inorganic adhesive (14) is not supported anywhere. Therefore, the halogen lamp body (11) must be kept being held until the inorganic adhesive (14) is dried and hardened to some extent, rendering it inefficient to produce the lamp with reflector.

[0013] Moreover, if the front opening (13b) of the lamp mount portion (13) on the concave reflecting section (12a) side of the reflector (12) is fully filled with the inorganic adhesive (14) in injecting the inorganic adhesive (14) into the gap between the pinch seal portion (11a) and the inside surface of the lamp mount portion (13), the inorganic adhesive (14) overflows into the concave reflecting section (12a), thereby deteriorating the appearance and also increasing the random reflection.

[0014] This raises a problem that, when the lamp is incorporated in a device for use as a product, the focalization is difficult in the device in which the lamp is incorporated.

[0015] Further, unless the bottom aperture (13a) for injecting the inorganic adhesive (14) is closed by a release paper (15), the inorganic adhesive (14) overflows also through the bottom aperture (13a), thereby deteriorating the appearance.

[0016] Furthermore, if a release paper (15) is used, it adds to the costs itself and also human labor is needed in sticking, releasing, and discarding the release paper (15), thereby further increasing the costs.

[0017] Another important feature, although not illustrated, is a fact that, in conventional lamps, only a part of the gap is filled with the inorganic adhesive (14) for fear that the inorganic adhesive (14) overflows through the front opening (13b) on the concave reflecting section (12a) side of the reflector (12), as mentioned above.

[0018] As a result of this, the heat in activating the lamp is not sufficiently conducted from the pinch seal portion (11a) to the lamp mount portion (13) of the reflector (12), raising a problem that the halogen lamp body (11) tends to be heated too much and, in the case of a high wattage halogen lamp, the lamp cannot withstand the heat unless the lamp is forcibly cooled by means of a fan.

**SUMMARY OF THE INVENTION**

[0019] A first object to be achieved by the present invention is to allow the pinch seal portion to be provisionally fitted onto the lamp mount portion simply by inserting the halogen lamp body with a pinch seal support and a lead rod support into the lamp mount portion of the reflector and to eliminate the need for holding the lamp body after injection of the inorganic adhesive.

[0020] A second object to be achieved by the present invention is to prevent deterioration of the appearance and difficult focalization caused by the injected inorganic adhesive.

[0021] A third object to be achieved by the present invention is to make available the use of a high wattage halogen lamp by improving the heat conduction from the pinch seal portion to the lamp mount portion of the reflector.

[0022] As an embodiment to achieve the aforementioned objects of the invention,

in a halogen lamp with reflector according to the present invention, a lead support mounted to a bottom aperture of a lamp mount portion of a reflector closes the bottom aperture; lead rods of the halogen lamp body are held by the lead support by being inserted into the lead support; an opposite opening on the concave reflecting section side of the reflector is closed by a pinch seal support mounted onto the pinch seal portion of the halogen lamp body; and the pinch seal portion is fixed at a predetermined position in the lamp mount portion by the pinch seal support.

[0023] Owing to this construction, the pinch seal support holds the pinch seal portion at a predetermined position in the lamp mount portion, and the lead rod support holds the lead rods at predetermined positions in the bottom aperture of the lamp mount portion, whereby the halogen lamp body is provisionally fixed at a predetermined position in the reflector.

[0024] This eliminates the need for holding the halogen lamp body until the inorganic adhesive is hardened to some extent after the inorganic adhesive is injected into a gap between the inner side of the lamp mount portion and the pinch seal portion.

[0025] Therefore, work can be successively carried out and the productivity of the halogen lamp with reflector according to the present invention is improved.

[0026] Further, since the pinch seal support can stop the adhesive from overflowing through the front opening of the lamp mount portion to the outside, the surface of the concave reflecting section is not contaminated even if a sufficient amount of adhesive is injected.

[0027] Thus, since a sufficient amount of adhesive can be injected into a gap between the pinch seal portion and the inside of the lamp mount portion, heat conduction between the pinch seal portion and the lamp mount portion of the reflector is improved, whereby a high wattage lamp can be produced due to good heat release even without forcible cooling.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

Fig. 1 is an exploded perspective view showing construction components of an embodiment of the present invention;

Fig. 2 is a vertical cross sectional view of the embodiment;

Fig. 3 is a lateral cross sectional view of the embodiment;

Fig. 4 is a view showing an essential part of the embodiment; and

Fig. 5 is a cross sectional view of a conventional halogen lamp with reflector.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

- [0029] Fig. 1 is a view showing construction components of this embodiment; Fig. 2 is a vertical cross sectional view of the embodiment; Fig. 3 is a lateral cross sectional view of the embodiment; and Fig. 4 is a view showing an essential part of the embodiment.
- [0030] A halogen lamp with reflector according to the present invention includes a halogen lamp body (1) and a reflector (2) having a lamp mount portion (3) for fixing the halogen lamp body (1) at its center.
- [0031] The halogen lamp body (1) used in this embodiment is a single-end type halogen lamp body (of course, a double-end type halogen lamp body (1) may also be used). The single-end type halogen lamp body (1) includes a pinch seal portion (1a) at one end portion and a light-emitting bulb section at another end portion in which a filament (7) is installed. The filament (7) is connected to lead rods (1b) protruding from the pinch seal portion (1a) to the inside of the light-emitting bulb section, via a pair of molybdenum metal foils buried in the pinch seal portion (1a).
- [0032] The reflector (2) is made of glass and includes a concave reflecting section (2a) and a lamp mount portion (3) disposed at a center of the concave reflecting section (2a) to protrude rearward and integrally therewith.
- [0033] A reflecting film is formed by plating, vapor deposition, or chemical reaction on the inner surface of the concave reflecting section (2a).
- [0034] The lamp mount portion (3) is a hollow prismatic body having an inner dimension decreasing a little toward its rear end. The lamp mount portion (3) includes a front opening (6) that opens at the center of the concave reflecting section (2a) and a bottom aperture (3b) at the bottom thereof.
- [0035] The pinch seal support (4) is made by processing a metal plate such as a stainless steel plate or a brass spring plate.
- [0036] The pinch seal support (4) includes an opening closing portion (4c) having a rectangular insertion hole (4d) disposed at a center thereof for inserting the pinch seal portion (1a) of the halogen lamp body (1), reflector abutting pieces (4a) bent from the two shorter sides of the opening closing portion (4c) to abut or to be in elastic contact with an inner surface of the shorter sides of the lamp mount portion (3), and pinch seal abutting pieces (4b) extending from the two shorter sides of the insertion hole (4d) and bent in the same direction as the reflector abutting pieces (4a) to abut the pinch seal portion (1a) for holding the pinch seal portion (1a) from both sides thereof.
- [0037] As will be understood from Fig. 2, the reflector abutting pieces (4a) have a length such that, when a later-mentioned lead rod support (5) is inserted into the bottom of the lamp mount portion (3), the tip ends of the reflector abutting pieces (4a) abut the lead rod support

(5) and the opening closing portion (4c) closes the front opening (6) formed at the center of the concave reflecting section (2a) of the reflector (2).

[0038] The outer dimension of the opening closing portion (4c) is approximately equal to the inner dimension of the front opening (6) formed at the center of the concave reflecting section (2a) of the reflector (2). The insertion hole (4d) is approximately equal to the cross section of the pinch seal portion (1a) so as to support the pinch seal portion (1a) inserted into the insertion hole (4d). Therefore, the front opening (6) is completely closed by the opening closing portion (4c) and the pinch seal portion (1a) inserted into the opening closing portion (4c). (Here, since the pinch seal portion (1a) is supported by the insertion hole (4d) as described above, the pinch seal abutting pieces (4b) are not necessarily needed. However, by providing the pinch seal abutting pieces (4b) and allowing the pinch seal portion (1a) to be held by the pinch seal abutting pieces (4b), the lamp body (1) is prevented from shifting or slipping off in the operation of injecting the inorganic adhesive (8) and subsequent operations.

[0039] Also, the pinch seal support (4) can be provisionally fixed in the lamp mount portion (3) by the reflector abutting pieces (4a) being in elastic contact with the inner surface of it (3).

[0040] The lead rod support (5) includes two lead rod through-holes (5c) for passing the two lead rods (1b) of the lamp body (1), and an adhesive injecting hole (5d) formed therebetween for injecting an adhesive (8).

[0041] A step portion is formed on the periphery of the lead rod support (5), whereby the lead rod support (5) includes a rectangular insertion section (5a) having approximately the same planar dimension as the inner dimension of the bottom aperture (3b) of the lamp mount (3), and a bottom abutting section (5b) having approximately the same planar dimension as the inner dimension of the bottom portion (3a) of the lamp mount portion (3).

[0042] Although the inner diameter of the lead rod through-holes (5c) is a little larger than the outer diameter of the lead rods (1b) of the lamp body (1), they are formed to have dimensions such that the inorganic adhesive (8) may not leak out from the gap thereof in a later-mentioned step of injecting the inorganic adhesive (8).

#### [Assemblage]

[0043] The assemblage is performed as follows. First, the pinch seal support (4) is fitted onto the pinch seal portion (1a) of the lamp body (1). In fitting the pinch seal support (4), the pinch seal portion (1a) of the lamp body (1) is inserted into the insertion hole (4d) from the side where the lead rods (1b) protrude.

[0044] This allows the pinch seal portion (1a) to pass through the insertion hole (4d). However, since the bulb section has a cross section larger than an inner diameter

of the insertion hole (4d), the bulb section cannot pass through the insertion hole (4d) and abuts the insertion hole (4c). Therefore, the insertion of the pinch seal portion (1a) of the lamp body (1) into the pinch seal support (4) is completed when the insertion hole (4c) reaches the bulb section.

[0045] When the insertion of the lamp body (1) is completed, the pinch seal abutting pieces (4b) abut the pinch seal portion (1a), thereby holding the pinch seal portion (1a) from both sides thereof.

[0046] Then, the lead rod support (5) is fitted onto the lead rods (1b). The two lead rods (1b) are allowed to pass respectively through the lead rod through-holes (5c) disposed in the lead rod support (5), thereby allowing the lead rods (1b) to protrude to the outside.

[0047] Next, the lamp body (1) having the pinch seal support (4) and the lead rod support (5) fitted thereon is inserted and fitted into the lamp mount portion (3) of the reflector (2).

[0048] In this state, the reflector abutting pieces (4a) of the pinch seal support (4) abut the inside of the lamp mount portion (3), and the opening closing portion (4c) of it (4) closes the front opening (6) of the lamp mount portion (3) on the concave reflecting section (2a) side.

[0049] As for the lead rod support (5), its insertion section (5a) is inserted into the bottom aperture (3b) of the bottom portion (3a), and its bottom abutting section (5b) abuts the bottom portion (3a). Here, as shown in Fig. 2, since the insertion section (5a) of the lead rod support (5) has approximately the same planar dimension as the inner dimension of the bottom aperture (3b) of the bottom portion (3a), the insertion section (5a) fittingly slides into the bottom aperture (3b), whereby the bottom abutting section (5b) closes the bottom portion (3a). At this stage, only the adhesive injecting hole (5d) is open.

[0050] Thus, the lamp body (1) is provisionally fixed in a state in which the pinch seal portion (1a) and the lead rods (1b) are positioned relative to the lamp mount portion (3) of the reflector (2) via the pinch seal support (4) and the lead rod support (5), respectively.

[0051] In recent years, in accordance with the improvement in lamp production technique, the position deviation of the filament (7) is extremely small, so that the variations among the lamp bodies (1) are small.

[0052] Therefore, focalization can be performed simply by mounting the pinch seal portion (1a) with the pinch seal support and the lead rod support onto a predetermined position in the reflector (2) as described above. This eliminates the conventional need for focalization by a three-dimensional and oscillating movement.

[0053] Thereafter, an inorganic adhesive (8) is injected into the lamp mount portion (3) through the adhesive injecting hole (5d) of the lead rod support (5). Due to presence of the opening closing portion (4c) of the pinch seal support (4), the inorganic adhesive (8) is stopped from overflowing into the concave reflecting section (2a), so that a sufficient amount of adhesive (8) can be injected without worrying about contamination in the

concave reflecting section (2a). Similarly, since the bottom aperture (3b) is also closed by the lead rod support (5), the inorganic adhesive (8) does not leak out through the bottom aperture (3b), either.

[0053] The lamp body (1) is held at a predetermined position in the lamp mount portion (3) by the pinch seal support (4) and the lead rod support (5) even after injection of the adhesive (8). This eliminates the conventional need for holding the lamp body (1) until the inorganic adhesive (8) hardens to some extent. Therefore, the next operation can be started by leaving the lamp body (1) alone, thereby improving the productivity.

[0054] Further, since a sufficient amount of the inorganic adhesive (8) can be injected, heat conduction between the pinch seal portion (1b) and the lamp mount portion (3) of the reflector (2) is improved, thereby a high wattage lamp can be produced by good heat release even without forcible cooling.

[0055] Here, although the number of components is increased as compared with the conventional halogen lamp, the overall costs in producing the halogen lamp of the present invention are lower than those in producing the conventional halogen lamp because of the aforementioned improvement in the productivity and non-use of an unexpectedly expensive release paper.

[0056] As shown and described above, the present invention provides a halogen lamp with reflector which allows the pinch seal portion to be fitted onto the lamp mount portion of the reflector simply by inserting the lamp body with the pinch seal support and the lead rod support into the lamp mount portion, thrashes the cost and prevents the inorganic adhesive from contaminating the concave reflecting section of the reflector, and is suitable for achieving high wattage.

5

mount portion.

2. A halogen lamp with reflector, comprising:

10

a halogen lamp body;  
a reflector having a tubular lamp mount portion for fitting a pinch seal portion of said halogen lamp body;  
a pinch seal support fitted onto the pinch seal portion and including an opening closing portion that closes a front opening of said lamp mount portion on a concave reflecting section side, reflector abutting pieces extending from the opening closing portion and abutting an inside surfaces of the lamp mount portion, and pinch seal portion abutting pieces extending from edges of an insertion hole which is formed in the opening closing portion and through which said pinch seal portion is inserted, to hold the pinch seal portion from both sides thereof; an insulating lead rod support that is fitted to lead rods of the halogen lamp and includes an adhesive injecting hole formed therethrough and closes a bottom aperture of said lamp mount portion; and  
an inorganic adhesive injected into the pinch seal portion.

15

20

25

30

35

40

45

50

55

60

65

70

75

80

85

90

95

100

105

110

115

120

125

130

135

140

145

150

155

160

165

170

175

180

185

190

195

200

205

210

215

220

225

230

235

240

245

250

255

260

265

270

275

280

285

290

295

300

305

310

315

320

325

330

335

340

345

350

355

360

365

370

375

375

380

385

390

395

400

405

410

415

420

425

430

435

440

445

450

455

460

465

470

475

480

485

490

495

500

505

510

515

520

525

530

535

540

545

550

555

560

565

570

575

580

585

590

595

600

605

610

615

620

625

630

635

640

645

650

655

660

665

670

675

680

685

690

695

700

705

710

715

720

725

730

735

740

745

750

755

760

765

770

775

780

785

790

795

800

805

810

815

820

825

830

835

840

845

850

855

860

865

870

875

880

885

890

895

900

905

910

915

920

925

930

935

940

945

950

955

960

965

970

975

980

985

990

995

1000

1005

1010

1015

1020

1025

1030

1035

1040

1045

1050

1055

1060

1065

1070

1075

1080

1085

1090

1095

1100

1105

1110

1115

1120

1125

1130

1135

1140

1145

1150

1155

1160

1165

1170

1175

1180

1185

1190

1195

1200

1205

1210

1215

1220

1225

1230

1235

1240

1245

1250

1255

1260

1265

1270

1275

1280

1285

1290

1295

1300

1305

1310

1315

1320

1325

1330

1335

1340

1345

1350

1355

1360

1365

1370

1375

1380

1385

1390

1395

1400

1405

1410

1415

1420

1425

1430

1435

1440

1445

1450

1455

1460

1465

1470

1475

1480

1485

1490

1495

1500

1505

1510

1515

1520

1525

1530

1535

15

Fig.1

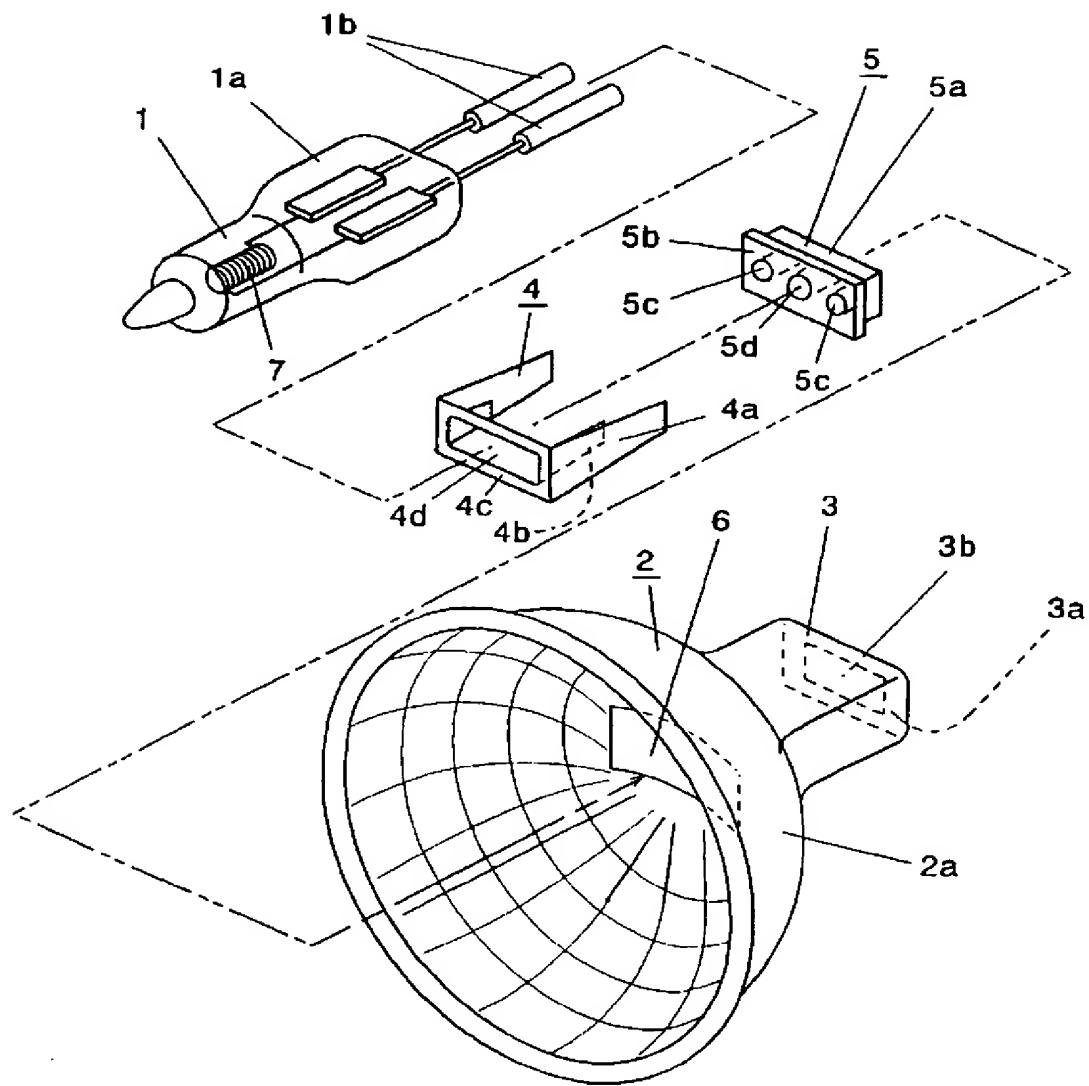


Fig.2

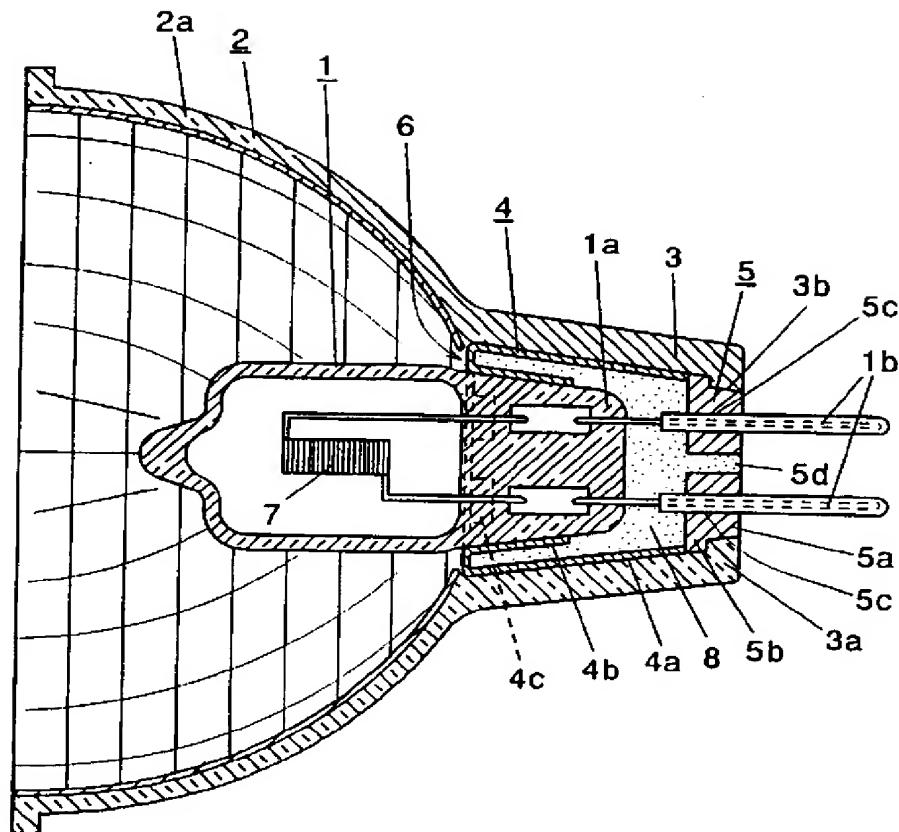


Fig.3

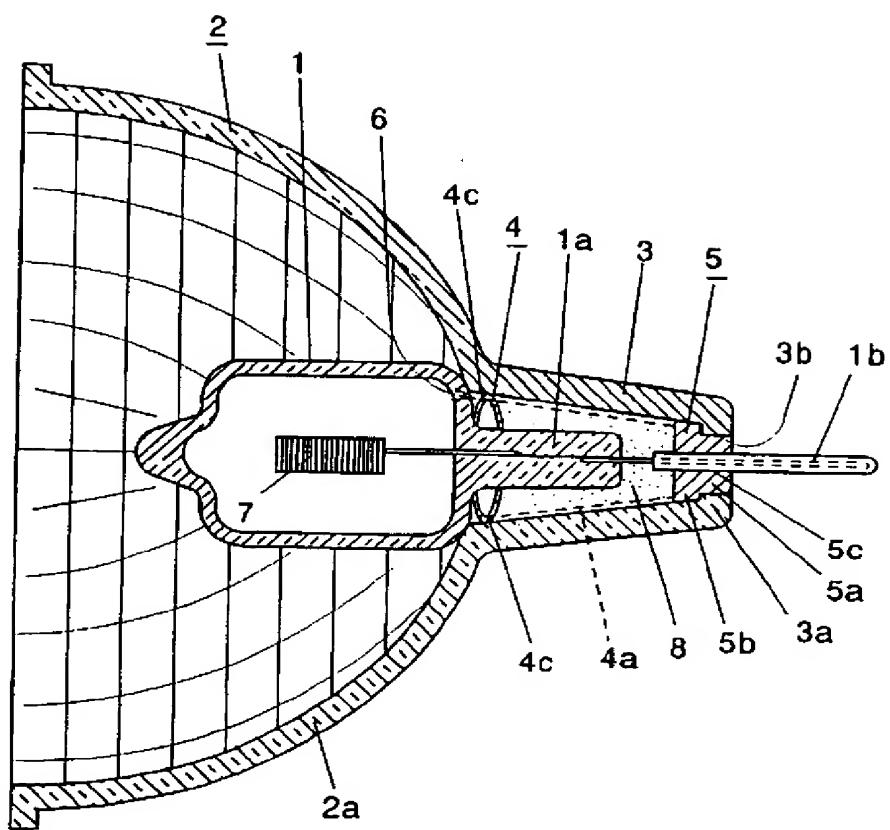


Fig.4

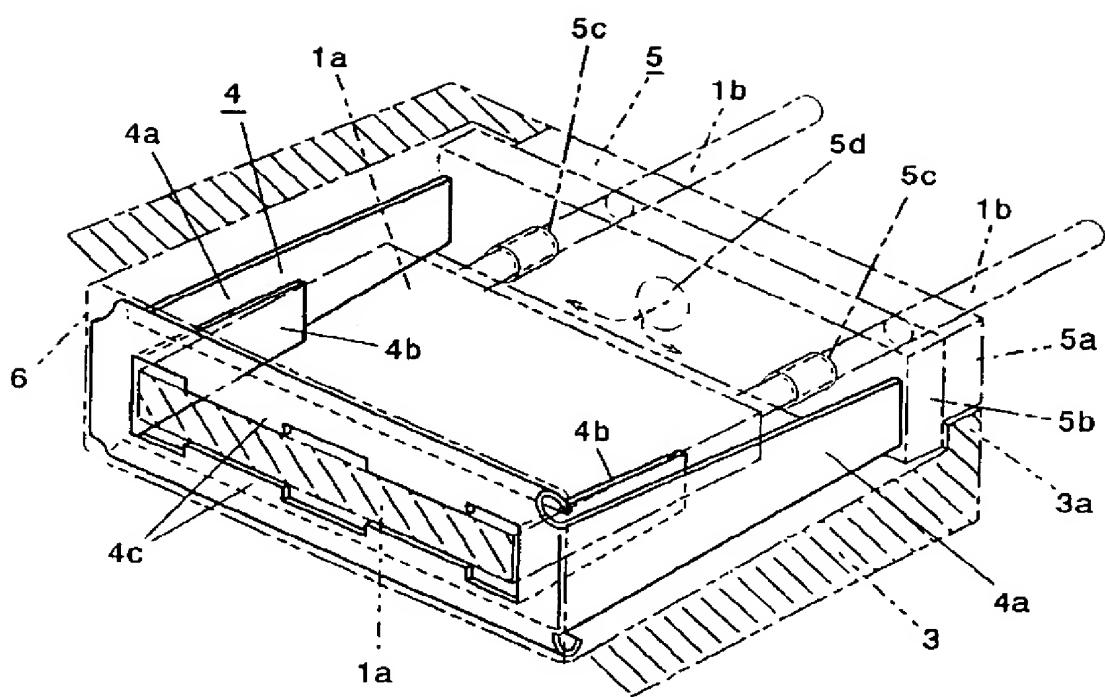
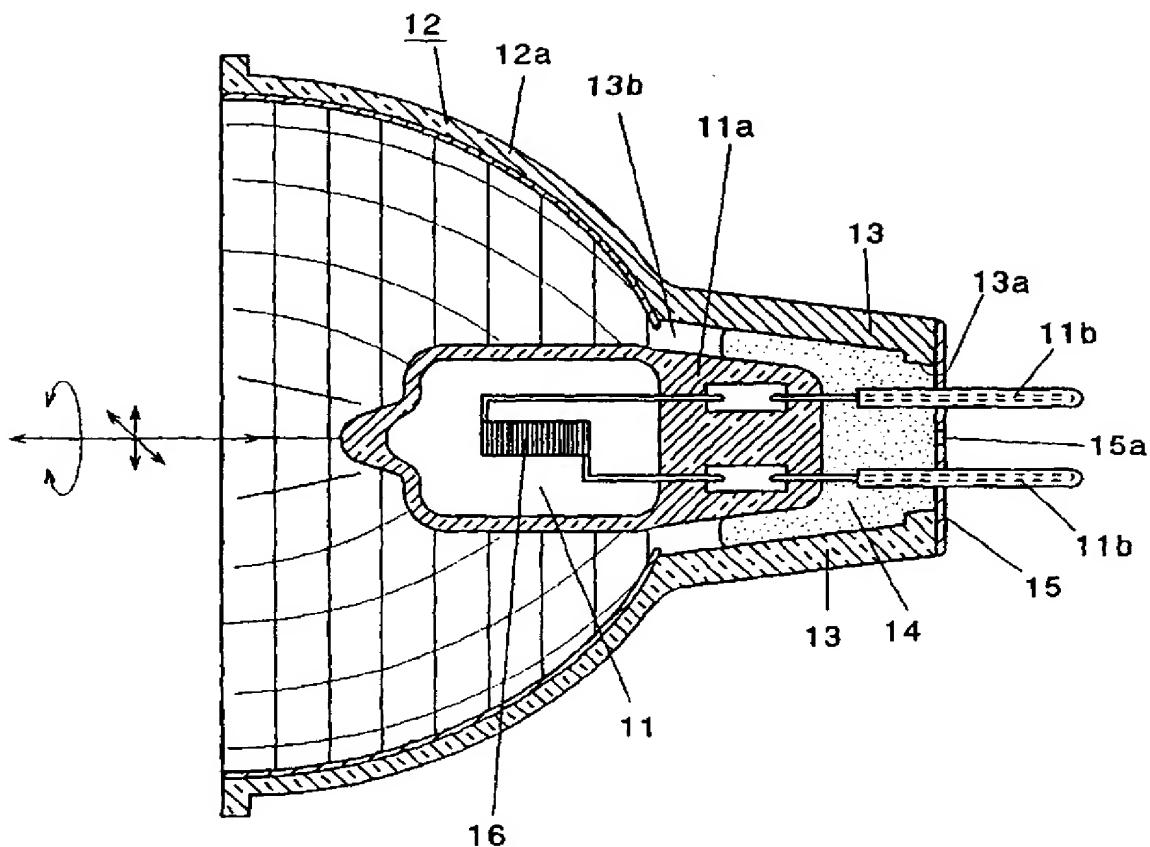


Fig.5





European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number

EP 99 30 9258

| DOCUMENTS CONSIDERED TO BE RELEVANT  |   |  | CLASSIFICATION OF THE APPLICATION (Int.Cl.)                |
|--|---|--|--|
| Category   | Citation of document with indication, where appropriate, of relevant passages   | Relevant to claim  |  |
| X  | EP 0 487 142 A (PHILIPS NV ;PHILIPS PATENTVERWALTUNG (DE))<br>27 May 1992 (1992-05-27)  | 1,3  | H01K1/00   |
| Y  | * column 1, line 21 – line 25 *<br>* column 1, line 58 – column 2, line 4 *<br>* column 2, line 45 – line 52 *<br>* figure *  | 2  |  |
| X  | EP 0 414 312 A (PHILIPS NV ;PHILIPS PATENTVERWALTUNG (DE))<br>27 February 1991 (1991-02-27)   | 1,3  |  |
| Y  | * abstract; claims; figure 1 *<br>* column 1, line 1 – line 29 *<br>* column 2, line 14 – line 17 *<br>* column 2, line 48 – line 53 *  | 2  |  |
| Y  | EP 0 541 474 A (LAMPARAS HALOGENAS S A)<br>12 May 1993 (1993-05-12)<br>* abstract; claim; figures *<br>* column 1, line 1 – line 12 *<br>* column 1, line 44 – column 2, line 10 *  | 1-3  |  |
| Y  | US 5 726 525 A (FRIEDERICHS WINAND H A M)<br>10 March 1998 (1998-03-10)<br>* abstract; claims; figures *<br>* column 1, line 1 – line 19 *<br>* column 1, line 52 – line 58 *<br>* column 2, line 13 – line 16 *<br>* column 2, line 26 – line 34 *<br>* column 2, line 55 – line 57 *<br>* column 3, line 15 – line 37 * | 1-3  | TECHNICAL FIELDS<br>SEARCHED (Int.Cl.)<br><br>H01J<br>H01K |
|  |   |  | -/-  |
| The present search report has been drawn up for all claims   |   |  |  |
| Place of search  | Date of completion of the search  | Examiner   |  |
| THE HAGUE  | 17 February 2000  | Martin Vicente, M  |  |
| CATEGORY OF CITED DOCUMENTS  |   | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or<br>after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br><br>& : member of the same patent family, corresponding<br>document |  |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another<br>document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |   |  |  |



European Patent  
Office

## EUROPEAN SEARCH REPORT

Application Number  
EP 99 30 9258

| DOCUMENTS CONSIDERED TO BE RELEVANT  |  |                      |  |
|--|--|----------------------|--|
| Category   | Citation of document with indication, where appropriate, of relevant passages  | Relevant to claim(s) | CLASSIFICATION OF THE APPLICATION (Int.Cl.7) |
| Y  | EP 0 420 214 A (TOSHIBA LIGHTING & TECHNOLOGY) 3 April 1991 (1991-04-03)<br>* column 1, line 1 - line 5 *<br>* column 1, line 50 - column 2, line 7 *<br>* column 3, line 11 - line 58 *<br>* column 4, line 9 - line 16 *<br>* column 5, line 31 - line 34; figures *<br>---- | 1-3                  |  |
| A  | US 5 129 849 A (BENSON TIMOTHY A ET AL) 14 July 1992 (1992-07-14)<br>* column 4, line 36 - line 38; figure 1 *<br>----   | 1                    |  |
| A  | PATENT ABSTRACTS OF JAPAN<br>vol. 1998, no. 11,<br>30 September 1998 (1998-09-30)<br>& JP 10 162627 A (IWASAKI ELECTRIC CO LTD), 19 June 1998 (1998-06-19)<br>* abstract *<br>-----  | 1                    |  |
|  |  |                      | TECHNICAL FIELDS SEARCHED (Int.Cl.7)         |
|  |  |                      |  |
| The present search report has been drawn up for all claims   |  |                      |  |
| Place of search  | Date of completion of the search   | Examiner             |  |
| THE HAGUE  | 17 February 2000   | Martin Vicente, M    |  |
| CATEGORY OF CITED DOCUMENTS  |  |                      |  |
| X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document  |  |                      |  |
| T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>S : member of the same patent family, corresponding document |  |                      |  |

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 30 9258

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

17-02-2000

| Patent document<br>cited in search report |   | Publication<br>date |                            | Patent family<br>member(s)                                      | Publication<br>date  |
|---|---|---------------------|----------------------------|---|--|
| EP 0487142                                | A | 27-05-1992          | JP<br>US                   | 4267049 A<br>5206799 A  | 22-09-1992<br>27-04-1993   |
| EP 0414312                                | A | 27-02-1991          | HU<br>JP<br>US             | 54829 A,B<br>3095853 A<br>5053935 A                             | 28-03-1991<br>22-04-1991<br>01-10-1991                             |
| EP 0541474                                | A | 12-05-1993          | DE                         | 69212432 D<br>69212432 T  | 29-08-1996<br>20-02-1997   |
| US 5726525                                | A | 10-03-1998          | CN<br>DE<br>DE<br>EP<br>WO | 1149929 A<br>69602694 D<br>69602694 T<br>0763251 A<br>9631895 A | 14-05-1997<br>08-07-1999<br>02-12-1999<br>19-03-1997<br>10-10-1996 |
| EP 0420214                                | A | 03-04-1991          | JP<br>JP<br>JP<br>US       | 3236154 A<br>3112050 A<br>3112051 A<br>5178712 A                | 22-10-1991<br>13-05-1991<br>13-05-1991<br>12-01-1993               |
| US 5129849                                | A | 14-07-1992          | US                         | 4855634 A   | 08-08-1989   |
| JP 10162627                               | A | 19-06-1998          |                            | NONE  |  |